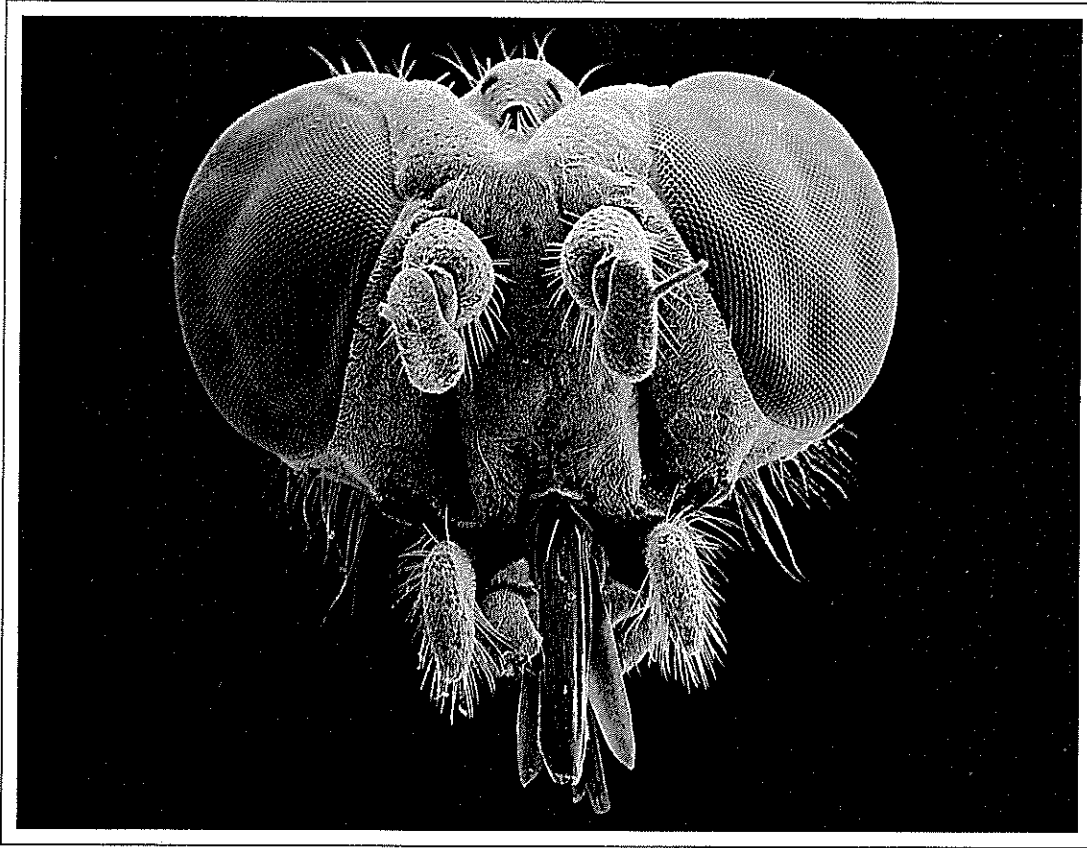


Yellowstone Science

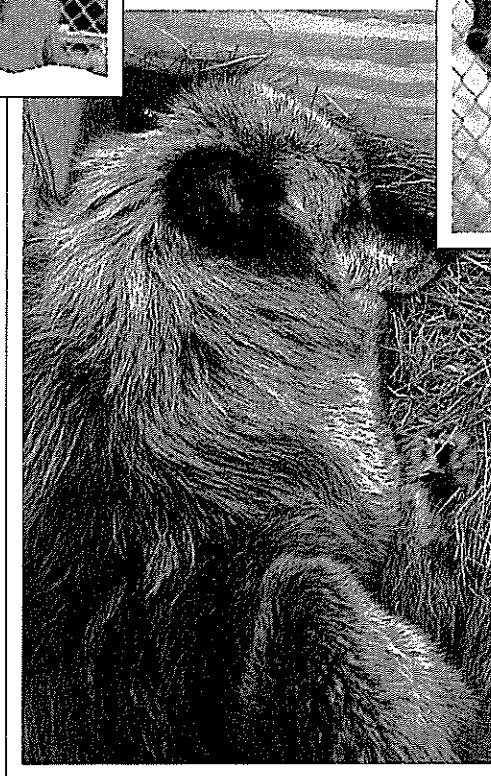
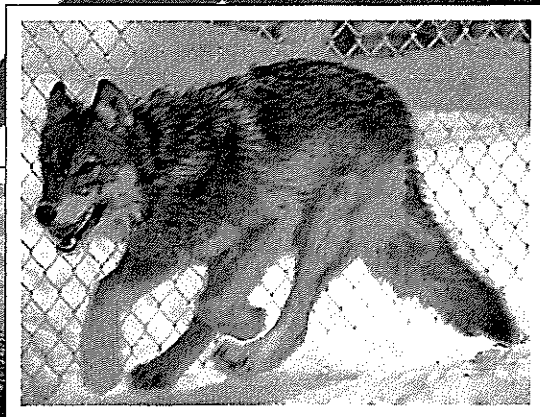
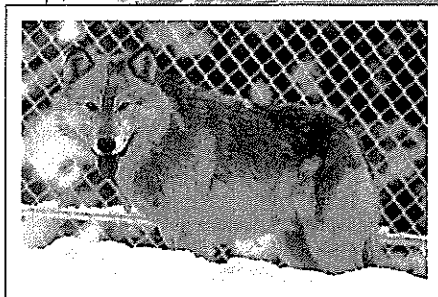
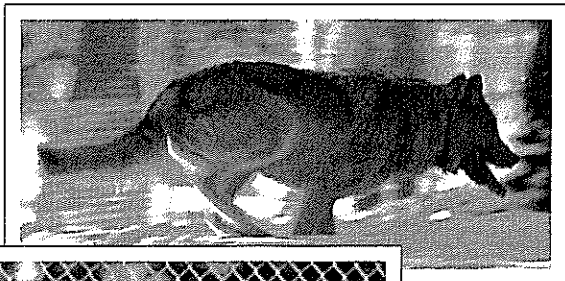
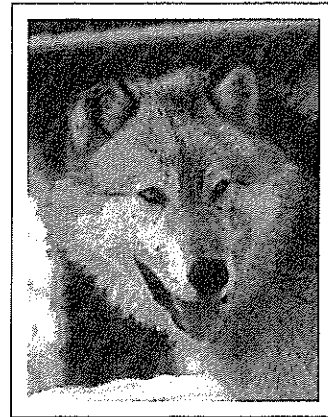
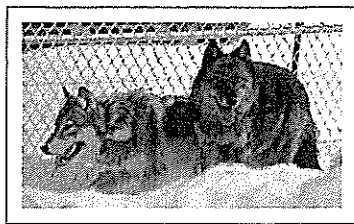
A quarterly publication devoted to the natural and cultural sciences



Yellowstone's Snipe Flies
Searching for Ptarmigan
Watching Grizzly Bears
Wolves at Work

Volume 3

Number 2



A Gallery of Wolves

It is a mighty understatement to say that there is a lot of interest in Yellowstone's new wolves, and so we will continue to provide updates on what's new with wolf restoration. However, we know that the interest operates on more than the straightforward informational level; news is important, but so are other kinds of impressions. With that in mind, we offer here a less formal presentation, so that you can see who is causing all this excitement. PS

Yellowstone Science

A quarterly publication devoted to the natural and cultural sciences

Volume 3

Number 2

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On the cover: Scanning electron micrograph (38X) of the head of a female snipe fly (Symphoromyia), showing the mouth parts that caused so much annoyance and misery among Yellowstone visitors in 1994. See article on page 2. Photo courtesy of John Burger, University of New Hampshire.

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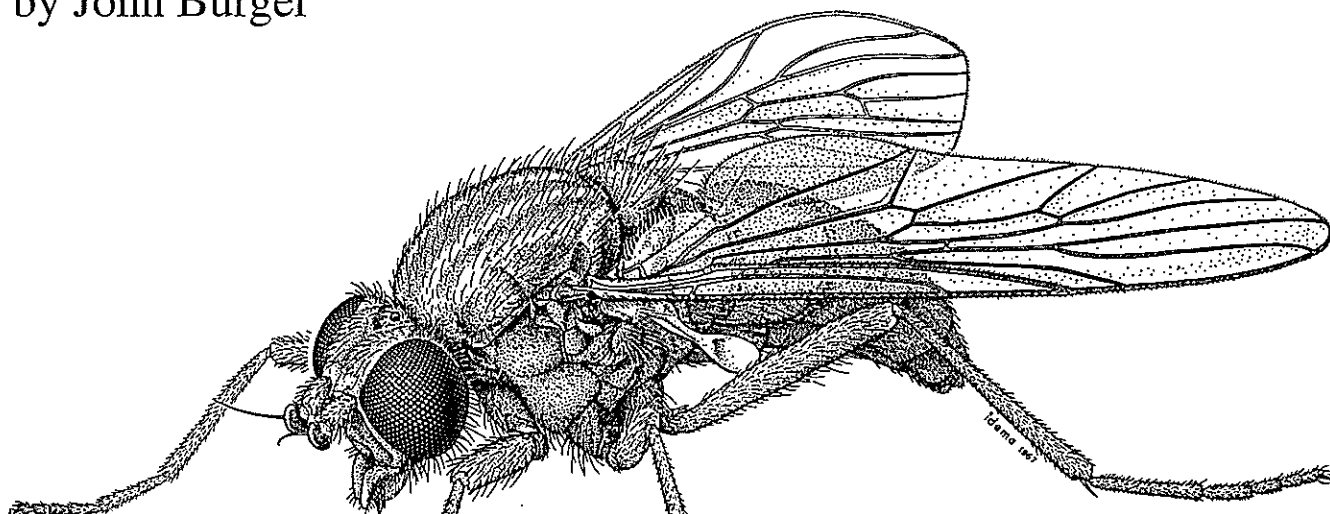
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Yellowstone's Snipe Fly Summer

by John Burger



For people and wildlife accustomed to dealing with the usual array of blood-sucking insects in Yellowstone-mosquitoes, buffalo gnats (black flies), horse flies and deer flies, no-see-ums (punkies), and stable flies (biting "house flies")—1994 was the year of the snipe fly. Snipe flies? Whoever heard of snipe flies? Well, almost no one, at least by their accepted common name, except for a few insect specialists, and occasional biologists who are curious enough to inquire. Yet these flies are notorious in some areas of western North America for their swarming habits and painful bites, and 1994 was a banner year for these usually obscure flies in the Greater Yellowstone Area. In fact, they were more abundant and pestiferous than at any other time in recent memory, and perhaps since the mid-1960s.

Possibly the most remarkable thing of all is that biting snipe flies, despite being serious pests locally, have been so little-studied by specialists, in contrast to mosquitoes, horse flies, and deer flies, that we cannot yet determine how many species actually occur in North America or consistently identify all specimens accurately. There are several reasons for their obscurity. Biting snipe flies comprise only one relatively small genus of rather small,

drab flies in the diverse family all of whose members snipe flies, and almost all of which do not feed on blood. Snipe flies are not known to transmit diseases of wildlife, domestic animals, or humans (although this has not been studied). They tend to be only locally abundant, with several to many years between serious outbreaks. They are difficult to identify accurately. What do we know about these flies in general, and their activities in Yellowstone in particular?

Biting snipe flies belong to the genus *Symphoromyia*, which means "accompanying fly," an appropriate description of their persistent swarming and biting habits. There are about 30 described species in North America, and probably a number of as yet indescribable species. Biting snipe flies in Yellowstone are gray, brown, or black, and can be recognized by the kidney-shaped terminal antennal segment with a thread-like projection on the upper surface, stout thorax, long, slender legs, unmarked wings, and slender, tapered abdomen. Their flying and biting habits are similar to deer flies (genus *Chrysops*, family Tabanidae), but deer flies in Yellowstone are black, or yellow and black with long, slender antennae,

large and Rhagionidae, are called all of Biting

larger chunky bodies, and dark markings on the wings.

Life Cycle

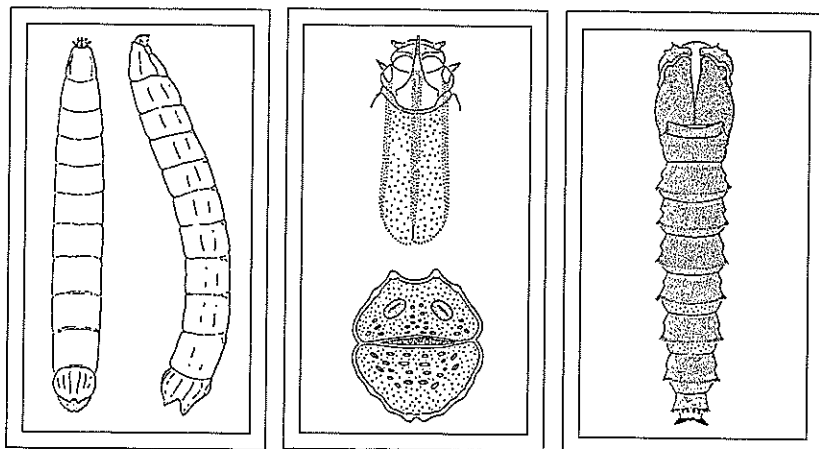
Little is known about the life cycle of *Symphoromyia* species. Most of what we know of the immature stages comes from studies by Kathryn Sommerman in Alaska. The eggs are 1 to 1.5 millimeters long (.04 to .06 in.) and off-white in color, becoming light brown before hatching. Eggs are laid on vegetation or on damp soil surfaces. The larva, when fully grown, is 12 to 16 millimeters (.47 to .63 in.) long and has a light-colored, 12-segmented cylindrical body. The front of the larva tapers to a slender, retracted head. The last body segment is deeply cleft, and the upper and lower surfaces are lined with sclerotized (hardened), semi-circular yellow-brown plates. The upper plates have two large brown spiracles used for respiration. Larvae have been collected from steep, well-drained slopes facing south, southeast, or southwest, in sheltered areas that are drifted with snow in winter, often in depressions with willows or alders. Larvae are predators, feeding on the larvae of soil-dwelling insects, including each other. The larva passes through at least three stages before transforming to the pupa. The pupa is 7 to 15 millimeters

Opposite: Female snipe fly, from "Agriculture and Agri-Food," from Manual of Nearctic Diptera, Volume I, coordinated by J. McAlpine, B. Peterson, G. Shewell, H. Teskey, J. Vockeroth and D. Wood; reproduced with the permission of the Minister of Supply and Services Canada, 1995.

Right: Two views of the snipe fly larva. Except where otherwise noted, illustrations and photographs for this article were provided by author.

Middle: The long retracted head of the larva, and the deeply cleft plates of the last body segment, viewed from the end.

Far right: Pupa of the snipe fly.



(.28 to .59 in.) long, has a freely movable abdomen, and is light brown initially, becoming nearly black just prior to emergence of the adult fly. The pupal stage lasts about 2 weeks. Little is known about the length of the life cycle; it is generally presumed that there is one generation per year.

Adult males do not feed on blood, are short-lived, and are rarely seen. They differ from females in having the eyes very large and nearly touching in the center of the head, and have more hirsute (hair-covered) bodies. Females have piercing-sucking mouthparts adapted for feeding on fluids, including blood.

Structure of the Mouthparts and Feeding Behavior

The mouthparts of female biting snipe flies are heavily sclerotized and are adapted for piercing, cutting, and anchoring, all of which assist them in ingesting blood. The broad labrum (lip) serves to provide support for the piercing stylets during biting. The paired mandibles, shaped like the blade of a sword, are used for cutting and penetrating the skin of the host, and for penetrating capillaries. The paired maxillae have retrorse (backward-pointing) teeth for anchoring the mouthparts during feeding. Blood oozing into subcutaneous tissues is ingested through the sponge-like labellum at the tip of the labium.

Symphoromyia females can be persistent and painful biters. The pain is associated with the large cutting mandibles. Unlike related horse flies and deer flies,

biting snipe flies tend to approach the host silently. Once settled, they are not easily disturbed, and often can be picked off or crushed while they feed. Often there is local swelling following a bite and there may be intense itching for several hours, possibly associated with the introduction of saliva to lubricate the mouthparts during piercing. Bites can cause severe reactions in hyperallergenic people.

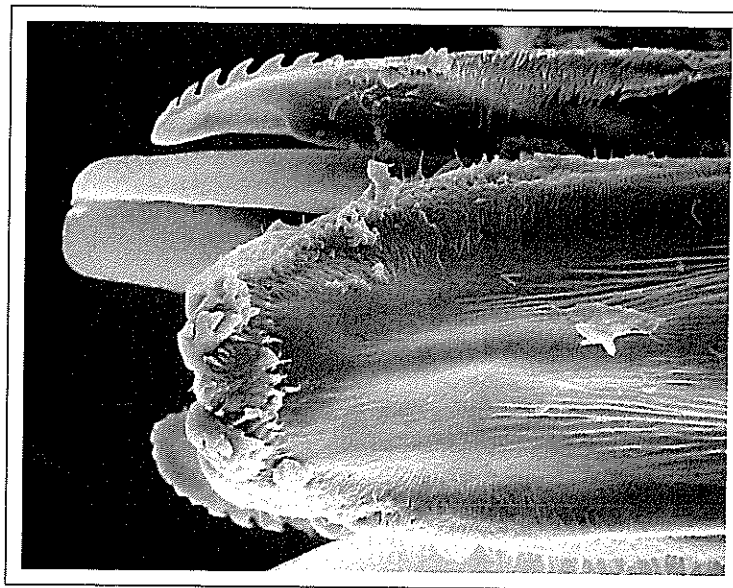
Some species seem more prone to feed on humans than others, especially in western North America. An eastern species is abundant in my front yard in New Hampshire but, while they will land and crawl on my arm, I have never been bitten. They will feed readily on dogs, however. Preferred areas for attack on humans seem

to be the head, neck, arms, and hands, although all areas of the body can be attacked. Biting on exposed fingers is particularly painful where there is little flesh, such as on the joints and knuckles. When abundant, females may form swarms around the head and body, and, even if not biting, can be extremely annoying.

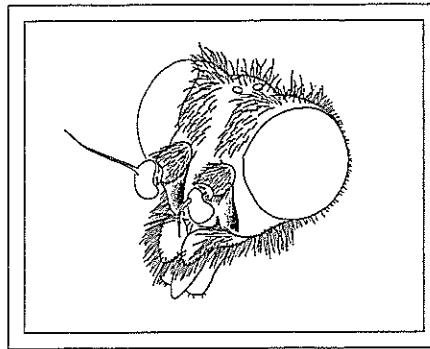
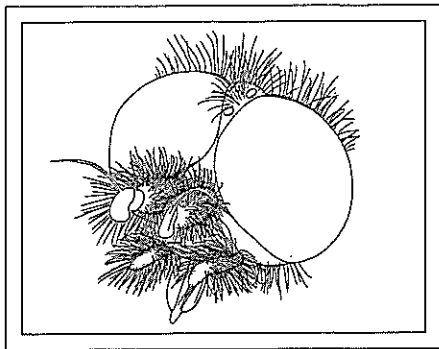
Biting Snipe Flies in Yellowstone

At least five species of *Symphoromyia* occur in the park, although because the taxonomy of this genus is still unsatisfactory it is likely that additional species may occur there as well.

Park personnel and local residents commonly refer to biting snipe flies as "deer



Scanning electron micrograph (573X) of the labrum and maxillae of *Symphoromyia flavipalpis*. Notice especially the "retrorse teeth" on the outer surface of the maxilla; these backward-pointing teeth ensure a firm grip on the victim's flesh.



The heads of a male (left) and female (right) snipe fly. Notice the larger eyes and hairier aspect of the male.

flies" or "buffalo flies," as well as various less polite names. Deer flies do have similar biting habits, but have larger, heavier bodies, and distinct dark markings on the wings. The term "buffalo fly" is used by specialists to refer to a species of biting fly that attacks water buffalo in Asia, and is a relative of the "horn fly," *Haematobia irritans* (family Muscidae), that attacks cattle in North America. Perhaps the most colorful name I have heard applied to snipe flies in Yellowstone was "those little gray bastards," by Jack McDonald, who worked at Silvertip Ranch just north of the park boundary. The trip by wagon to the ranch was along Slough Creek, an area notorious for large numbers of snipe flies.

The most abundant species of biting snipe flies in Yellowstone are *Symphoromyia flavipalpis* in relatively open country, primarily in the northern part of Yellowstone, and *Symphoromyia pachyceras* in forested areas of the park, above 2,100 meters (7,000 ft.). A third species, *Symphoromyia atripes*, is much less abundant and occurs primarily at higher elevations, usually above 2,400 meters (8,000 feet), in forested areas and in subalpine meadows.

The magnitude of snipe fly biting activity depends on year-to-year fluctuations in their populations. In an "average" year, biting activity begins about July 1, rapidly increasing during the first half of July, and reaching a peak during the last two weeks of July. Abundance gradually decreases during the first half of August, but the flies can still be locally abundant. Populations decline slowly during the last half of August and usually disappear entirely by the beginning of September. In a non-outbreak year, there may be only sporadic biting activity throughout the summer, with only one or

two flies occasionally attempting to bite. In outbreak years, the seasonal change in abundance is very conspicuous, with up to 25 to 50 or more flies attacking at a given time during peak activity in favored habitats.

Snipe Fly Habits and Habitats in Yellowstone

In open areas of sagebrush-grassland, stream bottoms, and in meadows in the northern part of Yellowstone, *Symphoromyia flavipalpis* can be so abundant that it is difficult to remain in one place for long without intense irritation and annoyance from bites or swarming of flies about the head and body. Swarms of 25 to 50 flies around people or horses are not uncommon in years of unusual abundance in areas such as Slough Creek valley, Lamar Valley to Soda Butte, and along the road to the northeast entrance. Once in 1967, I experienced a swarm of 75 to 100 flies circling my head and body on the lower slopes of Druid Peak, between Lamar Ranger Station and Soda Butte. Swarms were also attacking mule deer in the same area, causing them to seek shelter in heavy timber.

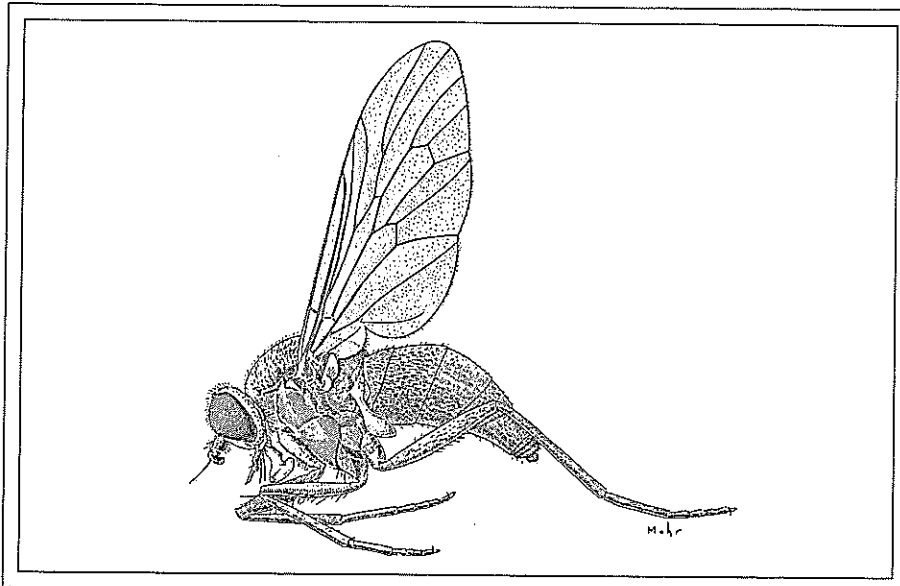
In forested areas, *Symphoromyia pachyceras* also occurs in very large numbers, but annoyance tends to be spatially localized. Observations made during the 1960s in the Lamar River drainage revealed that biting snipe flies in forested areas congregate in specific sites along animal and hiking trails. The trail between the Cold Creek patrol cabin and the Upper Lamar patrol cabin (at that time located southeast of Saddle Mountain, on the Lamar River) had three "fly belts" (a term borrowed from research on tsetse flies in Africa) along the trail. Each "belt" occupied about 200 to 300 feet of

trail. In each of these belts, flies would swarm around me and my horse, attacking my head and arms and the horse's head and neck. Areas of trail between these belts had relatively few snipe flies.

In common with horse flies and deer flies, snipe flies rest on vegetation along the trail and fly out and around passing animals, attracted by movement. These snipe fly belts appeared to be associated with areas of blowdown or dead trees, where older trees had fallen and were being replaced by younger growth, providing relatively open spaces adjacent to the trail. Snipe flies were less abundant in older growth forest. Biting activity also was particularly intense at the edges of meadows in mixed spruce-fir and lodgepole pine forest.

Clothing seems to inhibit biting, possibly because the mouthparts of snipe flies are relatively short and seem not to penetrate clothing readily, in contrast to mosquitoes and horse flies. Preferred areas of attack for horses seem to be the head and neck. Bison, elk, moose, and mule deer are attacked most frequently on the head and upper part of the body. Because snipe flies make a relatively large entrance wound when feeding, blood often oozes from bite areas after the fly has completed feeding. Horses often exhibit considerable local swelling on the head and neck when bitten repeatedly.

Snipe flies in Yellowstone vary greatly in abundance from year to year, as do deer flies. The reasons for this fluctuation are not clear. For example, 1967 and 1994 were particularly bad years for snipe flies, but 1966 and 1990 to 1993 were not at all remarkable. In 1967, June was very rainy, but July and August were unusually dry. Snipe fly populations may be affected by long-term weather patterns, soil moisture, winter snowpack, and by predators, parasites, and pathogens. A combination of a relatively dry fall, which could enhance larval survival by reducing mortality due to pathogens, followed by a relatively snowy winter that protects developing larvae in the soil, followed by



Female of Symphoromyia atripes, one of the less abundant species of snipe flies in Yellowstone, which prefers forested and meadow habitats at higher elevations (above 8,000 feet.).

a relatively wet spring that enhances soil moisture and larval survival, followed by a relatively dry summer that enhances adult activity might result in high adult populations. This is entirely speculation at present, but because unusually high populations of snipe flies in Yellowstone mercifully occur at irregular intervals, it is likely that a series of interlocking biotic and abiotic factors is responsible for year to year changes in adult abundance.

A question frequently asked in 1994 was whether the 1988 fires may have contributed to subsequent high snipe fly populations. This seems unlikely because there were no unusually "bad" snipe fly years until 1994. It is possible, however, that by opening up forests, the fires may indirectly benefit snipe flies, because they seem to congregate in relatively open areas along trails. Whether the fires created favorable breeding habitat is unknown.

Day to day changes in biting intensity are less of a mystery. The most intense biting activity occurs after two or three days of dry weather without the usual afternoon and evening thunderstorms that sweep through the park. This occurs most commonly with the passage of high pressure weather systems from the west. Snipe fly daily activity occurs during daylight hours in full or partial sunshine from about 10 a.m. to 5 p.m. Fly activity is depressed or absent on cloudy, cool or rainy days. Abundance varies greatly from place to place. On one July day in 1994, I was attacked unmercifully in open

sagebrush-grassland near Snow Pass, but I saw not a single snipe fly the same day along the Madison River near Madison Junction.

Effect of Snipe Flies on Wildlife

The effects of large snipe fly populations on wildlife and wildlife behavior in Yellowstone has not been studied, except for observations on seasonal movements of bison in the 1960s. In her study of Yellowstone bison, Mary Meagher noted the abundance of small, gray flies in the Upper Lamar and Mirror Plateau areas in 1965, and in Upper Lamar and Hayden Valley in 1967. She concluded that these flies may have influenced Upper Lamar bison movements during the summer months, and possibly might explain their concentration for two weeks in late July and early August along the eastern boundary of the park in 1967.

Why should snipe flies, in particular, be more annoying to animals than other bloodsucking insects? Unlike larger horse flies and deer flies, they are not easily dislodged once they begin feeding. They can attack in very large numbers, much larger than horse flies and deer flies. Their approach is silent, apparently not triggering the usual avoidance response seen in horse fly attacks. They are relatively small and inconspicuous, thus less likely to be noticed by animals. Their bites (at least to humans) are quite irritating, producing local swelling and itching that may persist for hours to days. Bison

react to snipe fly attacks as they do to other nuisance flies, stamping their feet, herding together, frequently using dust wallows, and rubbing against trees. The cumulative irritation due to large numbers of snipe fly bites may cause animals to seek shelter in heavy timber or to move to higher elevations where fly activity is reduced.

Avoidance of Snipe Flies

Periodic high populations of snipe flies are a fact of life in Yellowstone, but there are some measures that can reduce their annoyance to humans. Repellents that are effective against mosquitoes and other biting flies (usually containing diethyltoluamide, DEET) will not repel snipe flies. Some of the newer "natural" repellents that contain oil of citronella may be partially effective, but have not yet been tested against snipe flies. The best protection is to wear clothing that covers all exposed areas of the body. A broad-brimmed hat will discourage most flies buzzing around the head, and a bandanna will protect the neck area. In areas where flies are particularly abundant, gloves also are useful. Livestock can be partially protected with commercially available repellents containing oil of citronella or contact insecticides such as pyrethroids, although these materials may be less effective when snipe fly populations are particularly high.

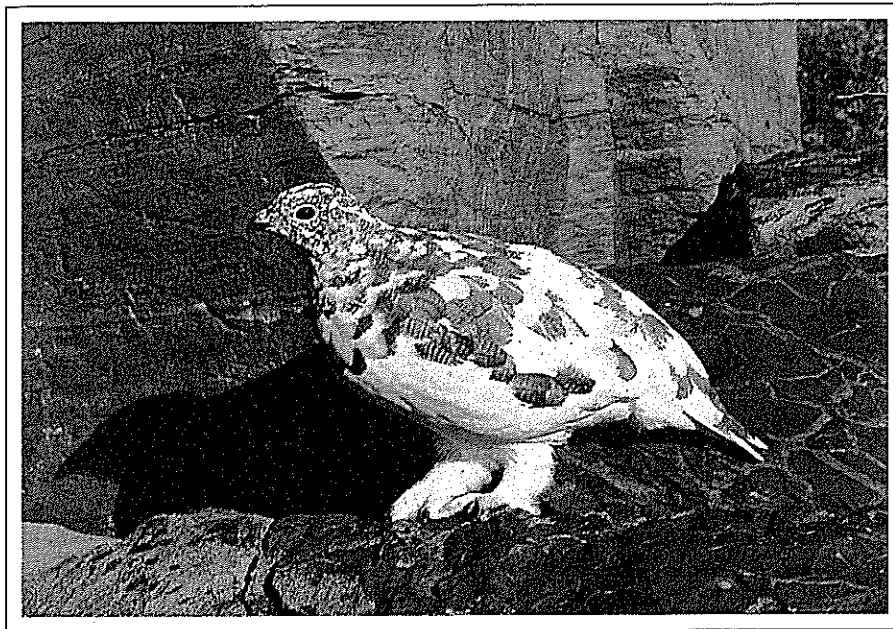
Conclusion

Much remains to be learned about the habits and biology, as well as the taxonomy of *Symphoromyia* species in Yellowstone, particularly what factors contribute to their abundance in particular years, and their influence on movements and behavior of wildlife populations.

John Burger is a professor of entomology at the University of New Hampshire, who has also offered to write us a broader article about many of the other "blood-sucking denizens" of Yellowstone.

The White-tailed Ptarmigan in Yellowstone

Searching for a high-country phantom



by Terry McEneaney

The white-tailed ptarmigan (*Lagopus leucurus*), the most diminutive grouse in North America, is easily distinguished by most people for two reasons. First, it has the ability to transform from brown plumage in the summer to white plumage in the winter, and second, it lives its life in the high alpine areas of western North America. Yellowstone is noted for its large amounts of snow, long drawn-out winters, and being a high-elevation plateau. A perfect place for white-tailed ptarmigan, you might say. There is genuine confusion as to the status of the white-tailed ptarmigan in Yellowstone. The purpose of this article is to clear up that confusion.

The information presented in this article is based on historical data and my own modern systematic searches of the Yellowstone high country. But before looking into the historical records, it is important to understand scientific think

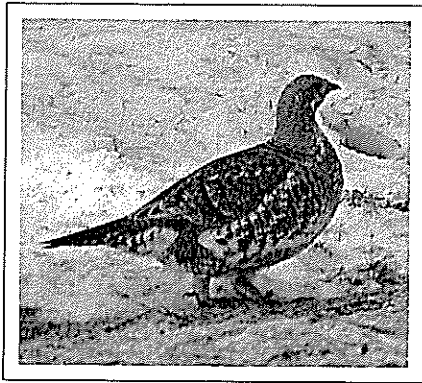
ing about the current status of this species.

In 1993, *The Birds of North America* series, sponsored by the Philadelphia Academy of Natural Sciences and the American Ornithologists Union published an article on the white-tailed ptarmigan showing the current distribution of this species to include Yellowstone National Park. Other publications, such as *A Birder's Guide to Wyoming* (1993) and *The National Geographic Field Guide to North American Birds* (1987) also show the range of the White-tailed Ptarmigan to include Yellowstone National Park. On the other hand, Peterson's *Field Guide To Western Birds* (1990) shows a range map with a question mark where Yellowstone National Park is located. *Game Management in Montana*, an outstanding publication produced by the state of Montana in 1971, indicated white-tailed ptarmigan being located just northeast of

Above: A genuine white-tailed ptarmigan photographed by the author in Glacier National Park.

Yellowstone National Park, in the Beartooth Mountains.

Now that we may be totally confused by the information presented in the field guides, we need to examine the historical records to determine their validity. In my opinion, of the several records available on the white-tailed ptarmigan in Yellowstone, only two records have any substance. The first recorded sighting was by Milton Skinner in 1927 on Quadrant Mountain, and an 1941 report by Lee Coleman described three grouse-like birds seen at a very close distance on Electric Peak. Both men were longtime local residents with extensive field experience in the region. Skinner was also the author of an early monograph on the birds of Yellowstone.



Since 1982, I have searched a high percentage of the alpine areas of Yellowstone National Park and have not yet found a white-tailed ptarmigan. The historical records and recent field guides show white-tailed ptarmigan occurring in Yellowstone, but systematic field surveys failed to find white-tailed ptarmigan. How can this be?

Part of the reason for the confusion over the white-tailed ptarmigan is because the bird is difficult to identify, particularly if the observer is inexperienced with the species. This is especially a problem in Yellowstone because the other grouse species found here sometimes have very atypical feather patterns not adequately described in field guides. For example, ruffed grouse (*Bonassa umbellus*) in Yellowstone have unusual amounts of white on their flanks, which can result in confusion between them and white-tailed ptarmigan.

Blue grouse (*Dendragapus obscurus*) in Yellowstone also possess large amounts of white on their flanks, making identification from field guides very confusing. Blue grouse in Yellowstone possess another characteristic not mentioned much in the literature: they have a habit of venturing far out onto sagebrush, where they are misidentified as sage grouse. And sometimes blue grouse venture above timberline into the alpine areas, and can be misidentified as white-tailed ptarmigan. This is especially true on the summit of Mount Washburn, where inexperienced visitors annually report white-tailed ptarmigan on the summit. Every report of ptarmigan on Mount Washburn from 1986 to the present has turned out to be a blue grouse.

With that background, let's take a closer look at the two most reliable records of the white-tailed ptarmigan in Yellow-

stone. The most recent record, an October 1941 observation of three grouse-like birds at close range on Electric Peak by then-ranger Lee Coleman, has some problems. Coleman decided that these birds were white-tailed ptarmigan because they were "grouse-like birds, plumage intermixed with white (one third of total surface), and feathers covering the toes." The weaknesses of this observation is that blue grouse in Yellowstone show similar characteristics, and that by October, white-tailed ptarmigan are primarily white in color. A further problem is that Coleman found the birds at 8,500-foot level on the north flank of Electric Peak, and the area described in this observation is located in conifers, increasing the probability that the birds observed that day were most likely blue grouse.

Proof of the existence or nonexistence of the white-tailed ptarmigan in Yellowstone really comes down to one observation. Milton Skinner's 1927 observation was as follows: "A single individual was seen on the top of Quadrant Mountain, above timberline and about a half a mile from the nearest tree." There is no detailed description of the bird in question; rather, the observation is based on the fact that it is "above timberline and about a half a mile from the nearest tree". Milton Skinner was a good ornithologist, but did he really see a white-tailed ptarmigan? No one will ever know for sure. But I can offer a series of possibilities or explanations as to what Milton Skinner may have found.

The possibilities include: 1) Skinner made an observation of an erratic white-tailed ptarmigan, members of the grouse family have been known on occasion to fly unusually long distances; 2) Skinner never really observed the bird at all, but perhaps was recording a sighting that

Other grouse species in Yellowstone, such as blue grouse (far left), and ruffed grouse (left), also occasionally have many white flank feathers, which may have confused some past observers into believing they saw a white-tailed ptarmigan.

someone else turned in to him (he was a park naturalist for some years); notice that he did not say "I observed" but rather "a single individual was seen"; or, 3) the white-tailed ptarmigan described by Skinner in 1927 was mistakenly identified. Could it have been a glue grouse? Who knows what went on that day? We do know that the current confusion regarding the presence of the white-tailed ptarmigan in Yellowstone is now largely based on this one questionable and poorly documented observation.

Given the habitat requirements of the white-tailed ptarmigan, namely expansive alpine areas above timberline, and rocky terrain with moist vegetation interspersed with willow alpine plant communities, it is unlikely that the white-tailed ptarmigan is a resident of Yellowstone. A viable breeding population does not currently exist. Despite the extensive fieldwork I have conducted here in Yellowstone, the numerous studies conducted in the alpine areas of the Beartooth Mountains by P. Hendricks, D. Pattee, R. Johnson, and N. Varley, and the less formal observations of hundreds of people who venture into the high country, reliable sightings of the white-tailed ptarmigan have not occurred. Until more detailed reliable information is collected on the white-tailed ptarmigan in Yellowstone, such as archaeological evidence or recent sightings by qualified observers, all field guides and scientific publications should refrain from depicting Yellowstone as definitive habitat for the white-tailed ptarmigan. Meanwhile, I will continue to search for the phantom bird of Yellowstone's most hostile environment, the alpine zone.

Terry McEneaney is Yellowstone's bird management biologist and author of several books about birds, including The Birds of Yellowstone (1988), The Birder's Guide to Montana (1994), and The Uncommon Loon (1990). This article is based on a paper presented to the Montana Academy of Sciences in 1994.